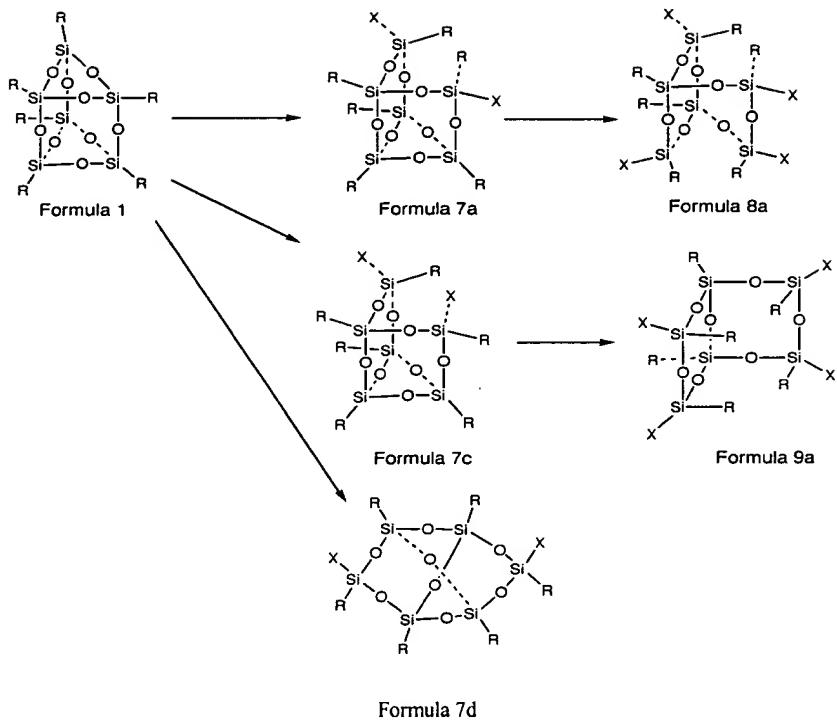


5. A method for selectively opening the rings in POSS compounds to form functionalized POSS derivatives comprising, reacting  $[(RSiO_{1.5})_n]_{\Sigma\#}$ ,  $[(RSiO_{1.5})_n(R^3SiO_{1.5})_m]_{\Sigma\#}$  or  $[(RSiO_{1.5})_n(R^1R^2SiO_{1.0})_m]_{\Sigma\#}$  with a strong acid to form said derivatives, having a conjugate base X, which base is F, OH, SH, NHR, NR<sub>2</sub>, ClO<sub>4</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>CF<sub>3</sub>, SO<sub>3</sub>OH, SO<sub>3</sub>Cl, SO<sub>3</sub>CH<sub>3</sub>, NO<sub>3</sub>, PO<sub>4</sub> or Cl, where n is 6-12, m is 1-10, where R<sup>1</sup>, R<sup>2</sup> and R<sup>3</sup> are different substituents than R which are all selected from the group consisting of aliphatic, aromatic, olefinic, alkoxy, siloxy and H and where # is the sum of the lettered substituents in said POSS compound.

10. The method of claim 5 wherein  $[(RSiO_{1.5})_n(R^3SiO_{1.5})_m]_{\Sigma\#}$  is reacted with said acid to form  $[(RSiO_{1.5})_6(R^3XSiO_{1.0})_1(RXSiO_{1.0})_1]_{\Sigma 8}$ , where R<sup>3</sup> is of the same group as R but is a different substituent and # is m + n.

11. The method of claim 5 wherein  $[(RSiO_{1.5})_7(R^3SiO_{1.5})_1]_{\Sigma 8}$  is reacted with said acid to form  $[(RSiO_{1.5})_4(RXSiO_{1.0})_3]_{\Sigma 7}$  and a by-product containing R3 wherein R<sup>3</sup> is of the same group as R but is a different substituent.

12. The method of claim 3 wherein the compound of formula 1 is reacted with said acid to form a compound selected from the formulas 7a, 8a, 7c, 9a or 7d as follows:



18. A polyhedral oligomeric silsesquioxane (POSS) compound of the formula,

C3

$[(RSiO_{1.5})_n(RXSiO_{1.0})_m]_{\Sigma \#}$ , where n is 4-24, m is 1-10, R is aliphatic, aromatic, olefinic, alkoxy, siloxy or H and X is the conjugate base of an acid, which base is of F, OH, when the OH groups are in an exo-stereochemical position, SH, NHR or NR<sub>2</sub>, ClO<sub>4</sub>, SO<sub>3</sub>OH, SO<sub>3</sub>CF<sub>3</sub>, SO<sub>3</sub>Cl, SO<sub>3</sub>CH<sub>3</sub>, NO<sub>3</sub>, or PO<sub>4</sub>.

20. A method for expanding rings in polyhedral oligomeric silsesquioxane (POSS) compounds

comprising, reacting  $[(RSiO_{1.5})_n(R(HO)SiO_{1.0})_m]_{\Sigma \#}$  with Y<sub>2</sub>SiR<sup>1</sup>R<sup>2</sup> silane reagents to obtain at

C4

least one expanded POSS ring in  $[(RSiO_{1.5})_{n+m}(R^1R^2SiO_{1.0})]_{\Sigma \#}$ , where R, R<sup>1</sup> and R<sup>2</sup> are aliphatic, aromatic, olefinic, alkoxy, siloxy or H, Y is halide or amine, n is 4 – 24, m is 1 - 10 and

j is 1-10 and # is the sum of the lettered substituents in said respective POSS compounds.

26. The composition of claim 25 selected from the group consisting of one of:

C5

540  
227